



## Modelling surface ozone during the 2003 heat-wave in the UK

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**Year:** 2010  
**Journal:** Atmospheric Chemistry and Physics. 10 (16): 7963-7978

### Abstract:

The EMEP4UK modelling system is a high resolution ( $5 \times 5$  km<sup>2</sup>) application of the EMEP chemistry-transport model, designed for scientific and policy studies in the UK. We demonstrate the use and performance of the EMEP4UK system through the study of ground-level ozone (O<sub>3</sub>) during the extreme August 2003 heat-wave. Meteorology is generated by the Weather Research and Forecast (WRF) model, nudged every six hours with reanalysis data. We focus on SE England, where hourly average O<sub>3</sub> reached up to 140 ppb during the heat-wave. EMEP4UK accurately reproduces elevated O<sub>3</sub> and much of its day-to-day variability during the heat-wave. Key O<sub>3</sub> precursors, nitrogen dioxide and isoprene, are less well simulated, but show generally accurate diurnal cycles and concentrations to within a factor of  $\sim 2$ –3 of observations. The modelled surface O<sub>3</sub> distribution has an intricate spatio-temporal structure, governed by a combination of meteorology, emissions and photochemistry. A series of sensitivity runs with the model are used to explore the factors that influenced O<sub>3</sub> levels during the heat-wave. Various factors appear to be important on different days and at different sites. Ozone imported from outside the model domain, especially the south, is very important on several days during the heat-wave, contributing up to 85 ppb. The effect of dry deposition is also important on several days. Modelled isoprene concentrations are generally best simulated if isoprene emissions are changed from the base emissions: typically doubled, but elevated by up to a factor of five on one hot day. We found that accurate modelling of the exact positions of nitrogen oxide and volatile organic compound plumes is crucial for the successful simulation of O<sub>3</sub> at a particular time and location. Variations in temperature of  $\pm 5$  K were found to have impacts on O<sub>3</sub> of typically less than  $\pm 10$  ppb. © 2010 Author(s).

**Source:** <http://dx.doi.org/10.5194/acp-10-7963-2010>

### Resource Description

#### Exposure : ☑

weather or climate related pathway by which climate change affects health

Air Pollution, Temperature

**Air Pollution:** Ozone, Other Air Pollution

**Air Pollution (other):** NO<sub>x</sub>;VOC

# Climate Change and Human Health Literature Portal

**Temperature:** Extreme Heat, Fluctuations

**Geographic Feature:** ☒

resource focuses on specific type of geography

None or Unspecified

**Geographic Location:** ☒

resource focuses on specific location

Non-United States

**Non-United States:** Europe

**European Region/Country:** European Country

**Other European Country :** England

**Health Impact:** ☒

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

**Mitigation/Adaptation:** ☒

mitigation or adaptation strategy is a focus of resource

Mitigation

**Model/Methodology:** ☒

type of model used or methodology development is a focus of resource

Exposure Change Prediction, Methodology

**Resource Type:** ☒

format or standard characteristic of resource

Research Article, Research Article

**Timescale:** ☒

time period studied

Short-Term (